The Regional Municipality of York

Committee of the Whole
Environmental Services
February 10, 2022

Report of the Commissioner of Environmental Services

Inflow and Infiltration Reduction Standard for Sewers Servicing New Development

1. Recommendations

1. Council approve implementation of the Inflow and Infiltration Reduction Standard for Sewers Servicing New Development

2. Council request that each of the nine local municipalities adopt the Inflow and Infiltration Reduction Standard for Sewer Servicing New Development by December 31, 2024

3. Council require local municipalities to include conditions of approval for development applications to ensure full implementation of the new standard by December 31, 2024

4. The Regional Clerk circulate this report to local municipalities, Building Industry and Land Development Association, Greater Toronto Sewer and Watermain Contractors Association, Ministry of the Environment, Conservation and Parks and Ministry of Municipal Affairs and Housing

2. Summary

This report requests Council approve the Inflow and Infiltration Reduction Standard for Sewers Servicing New Development (the Standard) and request the nine local municipalities to adopt and enforce this Standard by December 2024. The Standard outlines consistent design and construction methods based on best management practices and introduces new inspection, testing and monitoring requirements to ensure new sanitary sewer systems are constructed to be watertight.

Key Points:

- Inflow and infiltration (I&I) happens when water other than sewage enters into sanitary sewer systems. I&I can lead to basement flooding, system surcharges or

overflows to the environment and consumes system capacity triggering early-stage servicing challenges

- A need for I&I reduction or prevention in new development was first identified in 2011 in York Region's I&I Reduction Strategy which was prepared in response to a condition of approval from the Ministry of the Environment, Conservation and Parks (MECP) on the Southeast Collector Sanitary Sewer
- The Standard will ensure sanitary sewers are watertight at the time of construction using sound engineering requirements in design and vigilant inspection during construction and before assumption
- Components of the Standard have already been tested and implemented through York Region's Servicing Incentive Program (SIP) and Town of East Gwillimbury Sustainable Development Incentive Program (SDIP)
- Once adopted, local municipalities will enforce the Standard as a condition of approval of development applications until local design and construction standards are updated to ensure new developments are built to watertight standards by December 2024

3. Background

Inflow and infiltration reduction is a regulatory requirement and part of the Region's demand management program

On February 17, 2011, Council approved the first Inflow and Infiltration Reduction Strategy (Strategy), developed in partnership with local municipalities as part of the Southeast Collector Sanitary Sewer Individual Environmental Assessment approval (SEC IEA). The condition of approval required the Region and its local municipalities to find and remove 40 million litres per day (MLD) of inflow and infiltration by 2031.

I&I reduction has been an integral part to York Region's One Water Approach and supports its goal of innovation, integration, and infra-stretching[1] by reducing extraneous flows and freeing up capacity. I&I reduction enhances system resilience to climate change and supports the Region's Climate Change Action Plan and Energy Conservation objectives by reducing energy consumption and associated pumping costs while improving the level of service to the public. The Strategy is required to be updated every five years as per SEC IEA condition of approval mandated by MECP. Most recently, the Province has directed the Region to incorporate this work through Master Plan updates, which follows the Municipal

[1] Infra-stretching is maximizing the useful life and capacity of built infrastructure to defer capital investment.

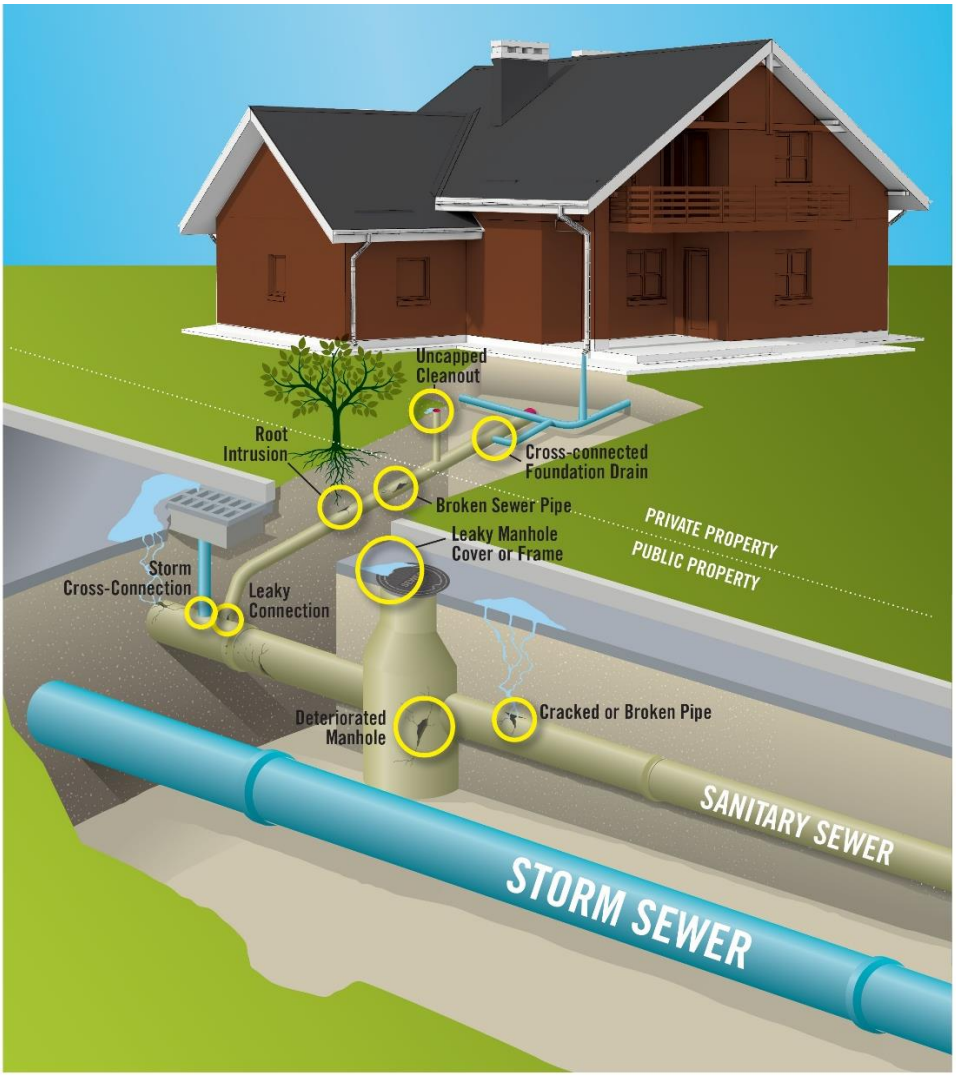
Class Environmental Assessment process. This directive also requires on-going implementation and monitoring to support other Regional initiatives, including capacity assessment, hydraulic modelling and system operation.

The 2021 Strategy Update refined programming to enhance partnerships, leverage flow monitoring data to set local municipal I&I reduction targets, advance data collection and analytics, enhance programming for existing sanitary sewer systems, and expand programming for new systems. Updated programming will ensure continued success towards the 2031 target as part of the draft Water and Wastewater Master Plan. Additionally, the draft York Region Official Plan (ROP) presented to Council on November 11, 2021 with anticipated finalization in 2022, continues to provide strategic direction which strongly encourages that "*Local municipalities, developers, and public agencies shall work toward reducing the amount of inflow and infiltration in both local and Regional wastewater systems consistent with Regional programs and standards*".

Figure 1 illustrates the various sources of I&I into sanitary sewers including those from private property.

Figure 1

Sources of Inflow and Infiltration



About 23 million litres per day of inflow and infiltration have been removed, equivalent to daily wastewater from about 24,000 homes

Since 2011, about 23 MLD of inflow and infiltration have been removed from the sewer system, representing more than 57% of the 2031 target (Figure 2). Reductions were achieved through operation and maintenance programs, capital works, and Public and Private Partnerships. Recent achievements include:

- Aurora Sewage Pumping Station outfall gate repair (2017) – 5.6 MLD

- Sewer rehabilitation projects in Markham, King, Vaughan, Whitchurch-Stouffville and Richmond Hill (2019) – collectively achieving 1.1 MLD

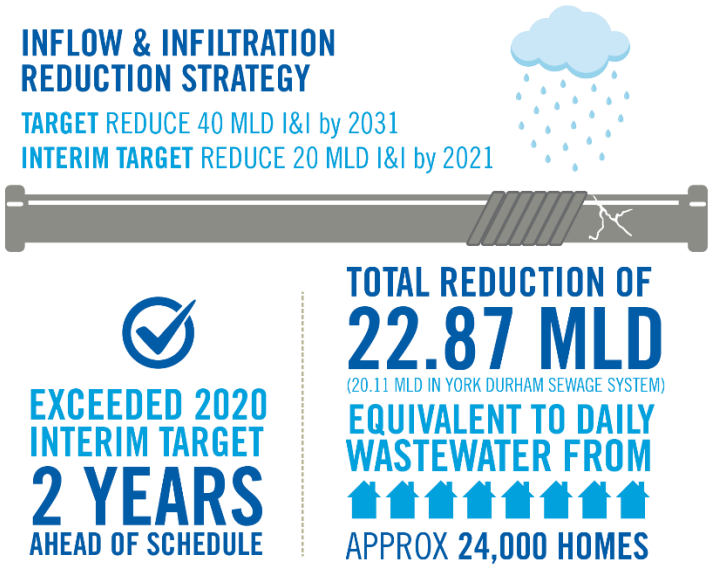
- Ninth Line sewer rehabilitation (2020) – 1.0 MLD

- Developer funded projects in Aurora and Newmarket (2015-2020) – collectively achieving 0.7 MLD

Achieving the remaining 17 MLD reduction will become more challenging as sources of I&I are more difficult and costly to locate and remediate as the majority of sewers are on private property. About 53% of sanitary sewer pipes in York Region are on private properties, 43% of sewers are owned and operated by local municipalities, and 4% of sewers are Region-owned. Sewers on private land (from property limit to building face) and local sewers are typically built by development industry and inspected by local municipalities. Upon determination of satisfactory completion, ownership of local sewers is transferred to local municipalities. Regional sewers are built, owned and operated by York Region. A collaborative effort with enhanced partnerships is imperative to build on the I&I reductions achieved to date and continue to drive future reductions in our new and existing sewer systems.

Figure 2

Inflow and Infiltration Reduction Program Achievements (2011 to 2020)



4. Analysis

York Region has been tackling I&I in new developments since 2011 and has seen success through the Servicing Incentive Program

The Region published its first Sanitary Sewer System Inspection, Testing and Acceptance Guideline in 2011 (2011 Guideline) with the objective to standardize procedures in new construction across York Region. Several local municipalities subsequently adopted this guideline for their sanitary sewer infrastructure, with over 5,000 units built, demonstrating that it is possible to meet low I&I rates. To further encourage implementation of the 2011 Guideline, Public and Private Partnership programs were adopted to provide capacity incentives through:

- York Region's Servicing Incentive Program for low rise residential buildings
- Town of East Gwillimbury Sustainable Development Incentive Program for low rise residential buildings

To date, 4,017 persons of additional wastewater capacity has been created through 32 participating projects with I&I reduction requirements and with 10 separate developer groups, across 4 municipalities (East Gwillimbury, Aurora, Newmarket and Richmond Hill). This capacity has been made available for specific new developments. This work has demonstrated the effectiveness of infra-stretching techniques implemented by the

development industry, our local municipalities and the Region. The rigour of implementing this work and verifying proven reductions has informed development of the new Standard presented in this Report. It also triggered a review of the Region's Servicing Incentive Program, currently under consultation with local municipalities, to be presented to Council in Q2 2022.

York Region has been a party to several developer-funded agreements that permit completion of inflow and infiltration reduction work in exchange for capacity allocation

In addition to the Servicing Incentive Program, York Region has engaged in other Public and Private Partnership initiatives with development industry and local municipalities. Since 2010, York Region has been party to developer-funded agreements in Newmarket, Aurora, Richmond Hill, Markham and Vaughan. The agreements permit completion of I&I reduction work in exchange for capacity allocation at a predetermined ratio of achieved reductions to allocation credits. The program allows a level of planned growth to continue without additional infrastructure investment and to date 13,188 persons of additional wastewater capacity has been allocated as a result of 6 agreements with another agreement to be executed in 2022.

Newer sanitary sewer pipes are exhibiting inflow and infiltration rates above design thresholds

Sanitary sewers in York Region are relatively new with 38% of the system being in service for less than 20 years (Attachment 1). This percentage is expected to increase with anticipated growth to 2051. Through a detailed analysis of wastewater flow and rainfall data across York Region, 24% of these newer sewers are found to already exceed average peak I&I; this level of leakage is more consistent with aged sewers of 40 years or greater. Almost 94% of newer sewers exceed the industry-accepted rate for new systems of 0.1.L/s/ha. By 2031, it is estimated 4.3 MLD of I&I, equivalent to wastewater flow from about 4,500 homes can be eliminated by adopting and enforcing the new Standard. Implementing the Standard will assist in achieving the overall reduction target of 40 MLD.

The new Standard adopts best management practices and will drive consistent I&I reduction requirements across all nine municipalities

The Standard adopts best management practices and includes standardized practices and procedures for design and construction, testing and inspection, flow monitoring technologies and analysis methods. The Standard will update and replace the 2011 Guideline and complement existing municipal standards.

Current Provincial standards and guidelines set out minimum requirements for designing and constructing new sewers. The Standard aligns with these guidelines and provides specific

requirements stipulated in the MECP Design Guidelines for Sewage Works and the Ontario Building Code. New inspection requirements on private sanitary infrastructure in the Standard are introduced to supplement Ontario Building Code requirements. This new requirement ensures water tightness and enhances public and environmental health and safety given a significant portion of sewers within York Region are on private property. Highlights of the key requirements in the Standard and comparison with the Provincial guideline and standards are included in Attachment 2.

A need for consistent I&I requirements for new sewers was identified through Region-wide review and surveys of existing standards

A *White Paper on Inflow and Infiltration in New Developments: A York Region Perspective* was circulated and presented to the industry in September of 2019, discussing the need and benefits in adopting best practices for reducing I&I from new developments. This white paper was presented to MECP through the Region's annual submission of our I&I reduction report in March of 2020. Overall, the Province and industry support moving towards consistent standards to reduce I&I in new sewers. The Region has also been proactive in submitting code changes to the Ontario Building Code and the National Research Council to advocate our work in best management practices in new development.

Analysis of the Region and local municipalities' experience in implementing the 2011 Guideline, and through literature review and surveys with all nine local municipalities and three other Regional municipalities, including the Region of Waterloo, Region of Durham and Region of Peel, the following areas within current standards and practices were identified:

- Lack of I&I reduction considerations in design, construction, inspection and testing of mainline sewers, maintenance holes, and lateral pipes;
- Sanitary pipe material and pipe selection not accounting for effects of groundwater table level and depth of pipe bury; and
- Inconsistent design, construction inspection and final sign off requirements across the Region.

Feedback from the development industry and direct field evidence were considered in developing improvements. These gaps have been addressed through development of the new Standard. Similar standards have already been implemented by Peel Region.

Consultation with key industry groups underscored the need for a uniform Standard across all 9 Local Municipalities

Given the lack of consistency on standards across the local municipalities in York Region, the development industry requested a uniform standard for construction, design and testing standards. Industry stakeholders were also interested in better understanding I&I in York Region and how changes in new construction practices, pipe materials and inspections can

effectively reduce I&I in new developments. Through rigorous engagement with our local municipal and development industry partners, we have collectively developed the Standard that will lead to more watertight sewers and align practices to one uniform approach.

Building Industry and Land Development Association, Greater Toronto Sewer and Watermain Contractors Association, Ontario Concrete and Drain Contractors Association and Ontario Concrete Pipe Association have commended York Region for the extensive engagement and inclusion of industry partners in developing the final standards. This Standard is a product of public and private interests and expertise coming together to close the gaps**.**

Local Municipalities support adoption of a new Standard following a phased approach to implementation

The new Standard applies to all new gravity sewer installations including those serving new subdivisions, site plans, industrial, commercial and institutional developments, and single service retrofit connections.

Local municipal staff support adoption of the Standard to be completed in four phases. It's anticipated that this new Standard will be incorporated into existing local design and construction standards in all local municipalities by December 2024. Key activities for each phase and associated timelines are presented in Table 1.

Table 1

Adoption Phases and Timelines

Adoption Phases	Key Activity	Timelines
1 – Roll out Standard	• Municipalities to include requirements to adhere to the Standard as a condition of development approvals and tie to securities managed by local municipalities	2022 – 2023
2 – Local municipalities to update existing standards with support from York Region	• Municipalities to adopt the Standard and incorporate into existing local design and construction standards • York Region to provide support to local municipalities through guidance on training and field testing procedures	2022 - 2024
3 – Evaluation through York Region flow monitoring	• York Region to pilot flow monitoring at one to two new developments per municipality	2023 - 2024

Adoption Phases	Key Activity	Timelines
	to assess performance of new Standard and success of implementation	
4 – Full Adoption	• All new construction in York Region to be built to watertight standards	By Q4 2024

New Regional sanitary sewers are large, deep trunk sewers which are typically constructed through various types of tunnel construction. These trunk sewers are designed and constructed in conformance with the York Region Environmental Services Capital Delivery Design Guidelines, which already implement components of the Standard. An update to these Design Guidelines for Regional trunk sewers is underway and will align with elements of Standard. The update is anticipated to be finalized in 2024, which is consistent with the adoption timeline for the Standard.

To measure effectiveness of the Standard and success of its implementation, flow monitoring will be piloted and managed by the Region between 2023 and 2024 in select subdivisions/site plans. This work will be completed in coordination with our local municipalities. A report back to Council on the effectiveness and program modifications will be shared.

2021 Strategy Update established targets to achieve the 2031 reduction target and drive implementation of the new Standard

In the 2021 Strategy Update, I&I reduction targets, presented in Table 2 were agreed to with each of the local municipalities. Using extensive data collected from more than 290 flow meters and 70 rain gauges installed throughout the Region, reduction targets were developed with local municipalities to focus on those areas with known high I&I. Each municipality has a specific target to be achieved by 2026 as an incremental contribution to the overall goal of 40 MLD by 2031. Reducing or preventing I&I from new development through adopting the Standard will help contribute to these 5 year targets.

Table 2

2026 I&I reduction targets for each municipality

Municipality	Million Litres per Day (MLD) reduction target
Town of Aurora	0.64
Town of East Gwillimbury	0.14
Town of Georgina	0.27
Township of King	0.12

Municipality	Million Litres per Day (MLD) reduction target
City of Markham	1.61
Town of Newmarket	0.52
City of Richmond Hill	1.55
City of Vaughan	1.36
Town of Whitchurch-Stouffville	0.21
York Region	2.15

5. Financial

Analysis shows that long-term benefits of implementing tighter sewer standards outweigh additional costs

Data collected by our consultant and from industry experts indicate that implementing the new Standard is estimated to incur 15-20% higher costs than the current practice, mainly from additional waterproofing requirements and testing on public and private infrastructure. However, costs to investigate and rehabilitate leaking pipes and maintenance holes can be greater than 35% of the capital cost of the original construction. In addition, accounting for reduced maintenance, reduced energy and treatment and reduced greenhouse gas emissions, the long-term benefits outweigh the additional cost over the lifespan of infrastructure by almost three times.

Despite York Region's and local municipal proactive and conservative management of their wastewater system, extreme rainfall events such as the ones that occurred in June of 2017 and January of 2020 could result in overflows at pumping facilities and areas of basement flooding due to increased inflow and infiltration. Avoiding impacts associated with these extraneous sewer flows such as spills to surface waters, environmental fines, residential sewer backups and extra pumping and treatment can add up to savings of approximately $258,000 per one kilometer of pipes.

This estimate does not account for additional indirect benefits such as avoided social and health impact costs associated with basement flooding, avoided rehabilitation costs and deferred capital investment for prematurely adding or expanding existing infrastructure. The risk of such wastewater overflows in York Region is expected to increase over time, due to forecasted growth rates and more frequent extreme rainfall events due to climate change. Implementing the Standard will enhance the system's sustainability and resiliency to climate change and help minimize costly impacts.

6. Local Impact

The Standard has been developed with full collaboration of all local municipalities and aligns with feedback from development industry

During the initial phase, local municipalities will require applicants to meet this Standard as a condition of development approval secured through subdivision and site plan agreements and associated securities. The Standard will be used in conjunction with current local design and construction standards and specifications. Local municipal staff, including plumbing inspectors, will enforce the Standard.

By 2024, local municipalities will integrate the Standard into their local standards either by incorporating it into relevant sections or as an amendment to existing design and construction standards. Local municipalities can impose more stringent requirements for site specific needs. Adoption will ensure new sanitary sewers are constructed to watertight standards required to reduce or prevent I&I, avoiding unnecessary maintenance in the long term while freeing up capacity to accommodate growth.

York Region continues to collaborate with local municipalities to support local Council endorsement and adoption of the Standard

A meeting with engineering, planning and operations staff from all nine local municipalities was held on July 9, 2021 to present the implementation plan and all concerns raised were resolved. All local municipal staff support this new tighter sewer Standard. Having a uniform standard Region-wide will assist in implementation with the development industry, construction contractors and other stakeholders. Region staff are working with local municipalities to report to their local Councils including sharing reports, presentations and communication materials.

Continued collaboration with local municipalities on I&I reduction efforts and commitment through local municipal inspections for early adoption of the Standard will help support local municipal I&I reduction targets and capacity management in the system to 2031 and beyond. It will save the Region and local municipalities costs for treating the additional flows, investigating and rehabilitating sources of I&I as systems age and reduce risks of basement flooding.

Additional resources may be required for enforcement of the Standard and can be recovered through engineering and development reviews fees

While flow monitoring is part of the Standard, initial participation will be voluntary until 2025; cost associated with flow monitoring will be borne by members of the land development industry.

7. Conclusion

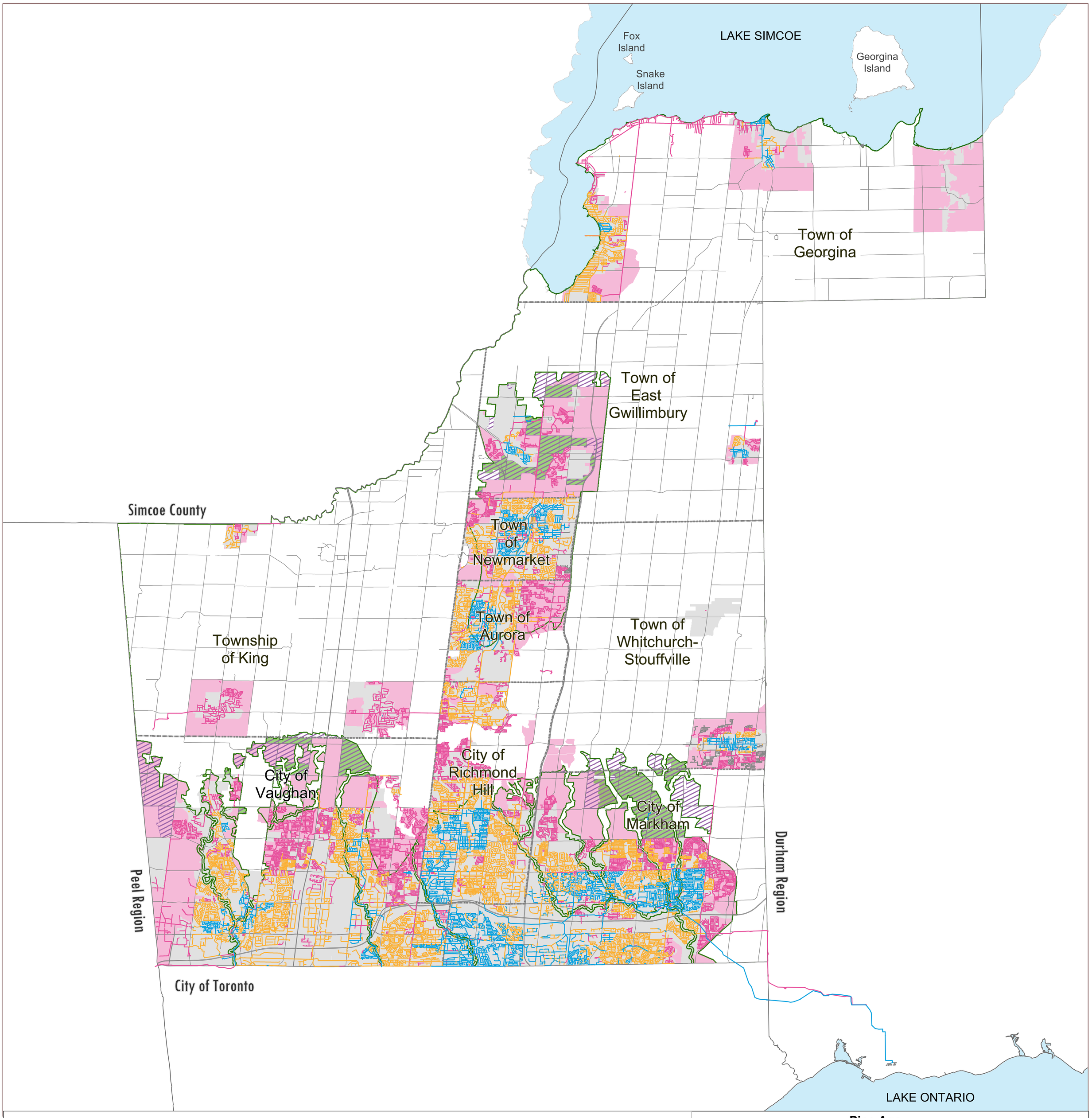
This report seeks Council approval to implement the Inflow and Infiltration Reduction Standard for Sewers Servicing New Development and requests local municipalities to adopt the Standard by December 2024. The Standard was developed through extensive engagement with local municipal staff and industry representatives to build watertight systems in new developments. Proactive management of I&I in new developments and preventative programming through standardized Region-wide requirements provides a significant return on investment, improved reliability and resiliency of public and private infrastructure and supports the achievement of 2031 40 MLD I&I reduction targets for Region and its local municipalities.

For more information on this report, please contact Wendy Kemp at 1-877-464-9675 ext. 74879. Accessible formats or communication supports are available upon request.

Recommended by: **Erin Mahoney, M. Eng.**
Commissioner of Environmental Services

Approved for Submission: **Bruce Macgregor**
Chief Administrative Officer

January 5, 2022
Attachments (2)
eDOCS #13550584



Sanitary Sewer Pipe Age in York Region

Inflow and Infiltration Reduction Standard for Sewers Servicing New Development

February 3, 2022

Produced by: The Regional Municipality of York
Infrastructure Asset Management Branch,
Environmental Services Department, December, 2021
Data Sources:
See York.ca for disclaimer information.

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York Region

Pipe Age

- Less than 20 years (37%)
- 20 to 40 years (44%)
- Greater than 40 years (18%)
- No Age Data (1%)

Draft York Region Official Plan, November 2021

- Future Urban Area
- Build Area
- New Community Area
- Designated Greenfield Area
- Greenbelt Boundary
- Road
- Municipal Boundary
- Regional Boundary

Key Updates in the I&I Reduction Standard for Sewers Servicing New Development

	I&I Reduction Standard for Sewers Servicing New Development	MECP Design Criteria*	Ontario Building Code
Applicability	Public and private-side infrastructure	Public-side infrastructure	Private-side infrastructure
Design and Construction	Includes detailed design and construction requirements for sanitary sewers, service connections, and maintenance holes focused on I&I reduction Offers tables and decision charts for pipe material selection based on both depth of bury and groundwater pressures. It also standardizes requirements for pipe colour selection (green for sanitary and white for storm) Additional waterproofing requirements and specifications and consideration given to locating maintenance holes away from flood prone areas	Introduces high-level I&I reduction related requirements in the design and construction of sanitary sewers, service connections and maintenance holes without specific requirement for material selection	Does not currently have specifications for proper lateral trench width and granular material type and compaction around the pipe Lack of appropriate standards for backfill, bedding and cover on the private side
Inspection and Testing	Requires public and private sanitary laterals to be CCTV inspected in accordance with local municipal standards Asks for air testing of new mainlines and private property laterals and provides detailed requirements on testing equipment, timing, frequency and procedures	Includes minimum testing and inspection requirements on public sanitary infrastructure only with no specific requirements on timing and frequency	Private lateral pipe tests (air test, visual inspection, water test) are in the OBC but not regularly enforced on all laterals CCTV inspection and in-person visual inspection of the laterals are not currently required in OBC

	I&I Reduction Standard for Sewers Servicing New Development	MECP Design Criteria*	Ontario Building Code
	Expands on testing maintenance holes to ensure water tightness Updated York Region's Sanitary Sewer System Inspection, Testing and Acceptance Guideline (2011 Guideline)		
Monitoring and Acceptance	Minimum 1 year of flow monitoring capturing winter and summer seasons and a minimum number of large storms Volumetric analysis for wet weather events under a 25-year storm with newly established monitoring thresholds, developed based on studies and analyses completed using York Region's own datasets: Rainfall capture coefficient (Cv) during summer of a minimum of 0.5% and Cv during winter of a minimum of 1.0% Maximum groundwater infiltration (GWI) allowance shall be 1.8 liters per day per meter of public sewer Monitoring will be piloted by the Region at first to assess success of standard (and not conformity) – before it becomes a mandatory requirement	Requires a long-term I&I rate not less than 0.26 L/s/ha for pipe sizing without specification of the design storm Specifies maintenance hole for provision of a flow monitor but no other requirements found	No requirements found

*MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (September 2021 Draft)